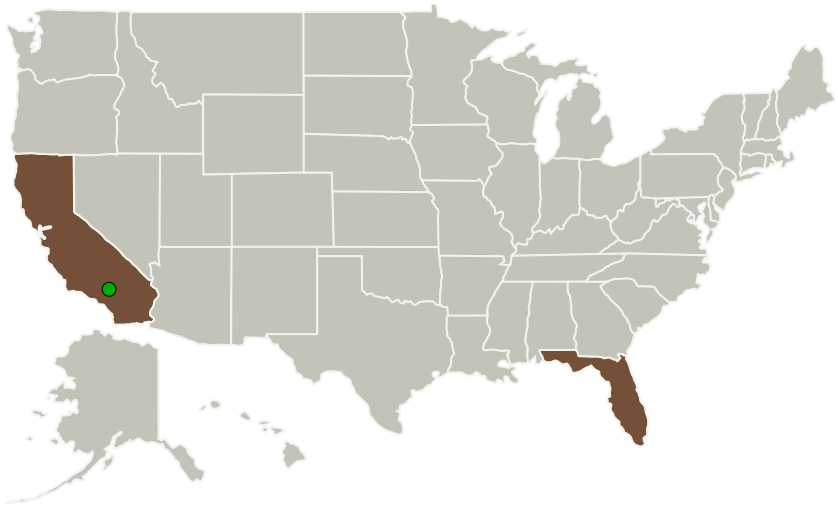
Distributed Sensing, Computing, and Actuation Architecture for Aeroservoelastic Control, Phase I

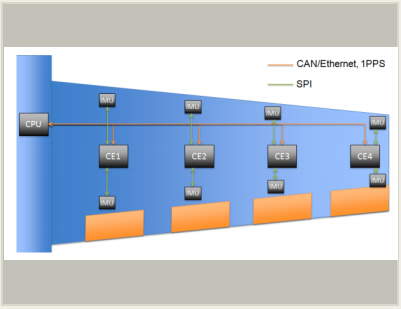
Completed Technology Project (2016 - 2016)

Project Introduction

This proposal introduces an approach to aeroservoelastic control that provides enhanced robustness to unmodeled dynamics. The core of the approach is a processing element, designed by the embedded-systems expertise at Prioria Robotics, that provides measurement and signal processing and even control commands from localized stations throughout a structure. An architecture is formulated that utilizes these distributed elements to provide information about the adverse aeroservoelastic effects, such as frequencies and damping and even mode shapes, to modify control commands and achieve desired performance characteristics. The research team has extensive expertise in the analysis, simulation, and flight testing of aircraft with novel configurations, including flexible wings, morphing aircraft, and reconfigurable designs. The proposed innovation is applicable to a wide range of aerospace applications including stratospheric UAVs and manned transport-category aircraft. The architecture enables closed-loop aeroservoelastic control or open-loop aeroelastic measurements and can be retrofit into an existing airframe and flight controller or integral to the design of a new aircraft. The Phase I objectives of the current proposal include the conceptual and initial design of a novel architecture for aeroelastic control. Initial effort involves requirements generation for the scalable architecture and dynamic simulation of a representative UAV wing. The architecture is implemented in hardware using modifications of existing electronic and airframe components.

Primary U.S. Work Locations and Key Partners





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Distributed Sensing, Computing, and Actuation Architecture for Aeroservoelastic Control, Phase I

Completed Technology Project (2016 - 2016)

Organizations Performing Work	Role	Type	Location
Prioria, Inc.	Lead Organization	Industry	Gainesville, Florida
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Florida

Project Transitions

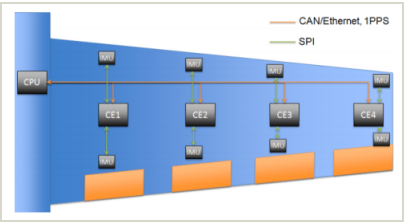
June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139847)*

Images



Briefing Chart Image
Distributed Sensing, Computing, and Actuation Architecture for Aeroservoelastic Control, Phase I *(https://techport.nasa.gov/image/134685)*

Final Summary Chart Image
Distributed Sensing, Computing, and Actuation Architecture for Aeroservoelastic Control, Phase I Project Image *(https://techport.nasa.gov/image/134378)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Prioria, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

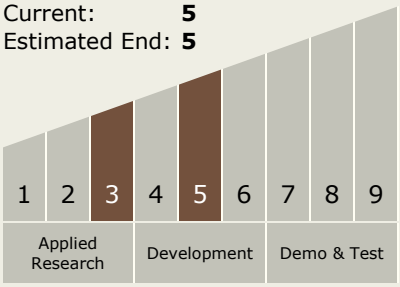
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Mujahid Abdulrahim

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Distributed Sensing, Computing, and Actuation Architecture for Aeroservoelastic Control, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.1 Software Development, Engineering, and Integrity
    - TX11.1.7 Frameworks, Languages, Tools, and Standards

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System